NOTES ON SOME ASIATIC MEROPIDAE (BIRDS)[1]

BY

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(*With a map*)

(*Communicated by Dr. Ernst Mayr—New York*)

INTRODUCTION

Receipt of 267 specimens of bee-eaters (Meropidae) in the Koelz Collection from India and adjacent countries has permitted a revision of the Indian species of this family. The family Meropidae is represented in India by the genera *Merops* (5 species) and *Nyctyornis* (1 species); related species of these genera are distributed throughout most of the Old World tropics and sub-tropics. In habits and appearance the Indian forms agree with other members of this family. Although these species are fairly well known taxonomically, there is still much to be learned about their distribution, migrations, plumages, and molts. Statements in the literature on these points are often misleading or lacking. In this review particular attention has been given to plumage sequence, seldom discussed in the standard references, yet in some instances a useful zoological character.

I am grateful to Dr. Walter Koelz for the privilege of examining his extensive collection. Drs. Ernst Mayr and Dean Amadon have directed and encouraged me in this study and I am greatly indebted to them for their helpful suggestions and kind advice. My thanks are due also to Capt. Jean Delacour for measurements of *M. leschenaulti* in the British Museum.

PLUMAGE AND MOLTS: The sexes are alike in coloration; females average smaller in size. The immature plumage somewhat resembles that of the adult but is generally duller. In those species with elongate central tail feathers these are acquired, along with the fully adult plumage, before the second summer. The post-juvenal molt normally takes place during the late summer and autumn but certain exceptions are to be found.

There is always one complete molt annually. The time and progress of this molt varies among the species; details will be found in the discussion under each form.

The primaries apparently initiate the molt or at least start concurrently with the body molt. They are replaced progressively and singly from the innermost; each wing is normally at the same stage. The secondaries are among the last feathers renewed; molt

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[1] Notes from the Walter Koelz Collections, Number 5. The previous papers in this subseries are: Number 1, *American Museum Novitates*, no. 1406, 1949; Number 2, *American Museum Novitates*, no. 1424, 1949; Number 3, *American Museum Novitates*, no. 1425, 1949; Number 4, *American Museum Novitates*, no. 1459, 1950.

is begun at each end of the series and proceeds to meet at the middle of the row. The tertials are probably replaced independently of the secondaries.

The tail molt does not begin until the fourth or fifth primaries are already out of their sheaths and is completed before the end of the wing molt. Friedmann's paper on the caudal molt of some non-passerine birds (1930, *Proc. U. S. Nat. Mus.*, **77**(7): 1-6) states that the tail molt of *Melittophagus revoilii* is irregular. This was the only bee-eater studied by Friedmann and suggested an investigation of the present material to determine the order of rectrix renewal in the six Indian species. The sequence of the caudal molt was found to be constant within each species, and for convenience will be expressed by means of a simple formula. For example, in *M. apiaster* molt begins with the central pair (1). The pair next alongside these (2) follow shortly, then the outer tail feathers (6) are replaced, and after these the third pair from the centre (3). Molted next are the pair inside the outermost feathers (5), and lastly the next inner pair (4). The tail molt pattern can thus be written: 1, 2, 6, 3, 5, 4. The order of rectrix renewal is given in Table 1 below.

TABLE 1

Order of rectrix renewal of six Indian bee-eaters

Species/Subspecies	Tail Molt Pattern
Merops l. leschenaulti	1, 2, 6, 3, –, –[a]
M. apiaster	1, 2, 6, 3, 5, 4
M. superciliosus persicus	1, 2, 6, 3, 5, 4
M. p. philippinus	1, 2, 6, 3, 5, 4
M. o. orientalis	1, 6, 3, 2, 4, 5
Nyctyornis athertoni	1, 2, 3, 6, 5, 4

(*a*) full sequence indeterminable with present material.

In these forms the pattern of rectricial ecdysis does not appear to have systematic significance above the specific level. It is possible that the molt sequence would be found to vary geographically if a large series of molting individuals of different subspecies were studied.

MEASUREMENTS: All measurements are given in millimeters. Bill length refers to a measurement taken from the anterior border of the nostril to the tip of the culmen. The length of the wing was taken with the wing pressed flat on the rule. Wing-tail index, where given, is the ratio of the length of the tail to the length of the wing expressed as a percentage of wing length. Similarly, the tail-bill index is the ratio of bill length to tail length expressed as a percentage of tail length. With the exception of *M. leschenaulti* and *N. athertoni* the measurements are only those of the specimens in the Koelz Collection and are of fully adult unworn birds.

Localities: Under each species and subspecies heading a list is given of the specimens collected by Dr. Koelz. These previously unpublished records should be useful in mapping the ranges and migrations of these species.

Merops leschenaulti

The Bay-headed Bee-eater is widespread in the Indo-Malayan Region, but in the Greater Sunda Islands it occurs only on Java and Bali. A very similar species, *M. viridis*, is present on Sumatra and may replace it ecologically, though both species occur in southeastern Asia, Java, and Bali.

There is some individual variation in color in the species, chiefly in depth of color of the head and back, but there is considerable geographic variation among populations. The Java and Bali birds, *quinticolor*, are, even in freshly molted specimens, bluish on the upper surface of the tail and the tips of the secondaries. Members of the other populations have these areas normally green, but they often become blue through wear. The chestnut pectoral band bordered posteriorly by a black band is absent in *quinticolor*; only the black band is retained.

There is also considerable geographic variation in size; Table 2 shows the measurements of three populations within the species.

These measurements indicate that the Andaman Islands birds are larger, with longer tail and wings; the Java and Bali birds are shorter-winged and shorter-billed; the mainland birds are intermediate in size.

On the basis of the above-mentioned differences *Merops leschenaulti* can be divided into three subspecies as follows:

Merops leschenaulti leschenaulti Vieillot

Assam: Khasia Hills, Nongpoh, May 2-6, 1949, 4 ad. ♂, 3 ad. ♀. United Provinces: Kumaon, Tejan, June 4, 1948, 1 ad. ♂, 1? imm. ♀; Kathgodam, August 19-20, 1 ad. ♂, 2 imm. ♂. Nepal: Hitaura, May 20-June 13, 1947, 5 ad. ♂, 4 imm. ♂, 2 unsexed imm. Bastar: Korher, March 25, 1949, 1 ad. ♂. Southern Madras Presidency: Nilgiri Hills, Kunjapanai, February 19-20, 1937, 3 ad. ♂; Nilambur, March 3, 1 ad. ♂. Southern Bombay Presidency: Jagalbed, February 21-March 4, April 14, 1938, 5 ad. ♂, 5 ad. ♀; Castle Rock, March 5-6, 2 ad. ♂, 2 ad. ♀.

Type locality: Java, error = Ceylon.

Range: Ceylon and the west coast of India north to Belgaum; the United Provinces, Nepal, Assam, Orissa, eastern Bengal, to Burma, Yunnan, Siam, and French Indo-China. Chasen (1939, *Bds. Malay Peninsula*, **4**: 100-101) says he knows '. . . of no reliable record from south of Kuala Kangsar in Perak . . .'. There are, however, several specimens from Pahang in the collection of the American Museum of Natural History, two from Gunong Tahan and two from 'Sungei Lebih'. Therefore, about five degrees north latitude seems to be the southernmost limit of the range in Malaya.

Freshly molted birds are dark green on the back and a rich chestnut brown on the crown and nape. Like other members of the genus,

TABLE 2

Measurements of adults of *Merops leschenaulti*

Region	N	Wing	N	Tail	N	Bill
Mainland	32♂	104–113 (107·4)[a]	29♂	78–85 (80·9)[c]	36♂	25–32 (28·6)[e]
	29♀	100–112 (106·0)[b]	30♀	75–84 (79·6)[d]	30♀	26–30 (28·0)[f]
Andamans	14♂	107–115 (111·2)	14♂	81–94 (88·5)	12♂	26–34 (31·0)
	8♀	107–112 (108·7)	8♀	85–97 (90·1)	8♀	29–32 (30·4)
Java, Bali	8♂	95–105 (99·4)	9♂	75–83 (79·2)	9♂	24–27 (25·4)
	4♀	97–102 (99·0)	4♀	80–82 (81·5)	4♀	24–28 (25·4)

[a] $\sigma = 2{\cdot}3$ [c] $\sigma = 1{\cdot}7$ [e] $\sigma = 1{\cdot}6$
[b] $\sigma = 2{\cdot}3$ [d] $\sigma = 2{\cdot}0$ [f] $\sigma = 0{\cdot}3$

this bee-eater nests in holes along the banks of streams; as a consequence the plumage of breeding birds becomes worn, causing the feathers of the back, wings, and tail to acquire a bluish tinge and the feathers of the head and nape to become paler.

Immatures are distinguishable by their smaller bill and by having the crown and nape concolorous with the back, which is green. The breast markings of immatures are indistinct.

The annual post-nuptial and the post-juvenal molt may take place from late May through October.

Merops leschenaulti andamanensis, new subspecies

Type: A.M.N.H. No. 641320, Rothschild Collection; adult male, Port Blair, South Andaman Island; December, 1897; A. L. Butler, collector.

Agrees in coloration with the nominate race but differs in being larger, with longer tail and wings.

Range: South Andaman Island and probably other islands of the group. Hume (1874, *Stray Feathers*, pp. 163-164) says, 'This species . . . is also found . . . in the Great and Little Cocos, Strait Is., etc., etc. We never met with this species in the Nicobars'. Nesting is apparently in the middle of May.

Merops leschenaulti quinticolor Vieillot

Type locality: Ceylon, error=Java.

Range: Java and Bali.

Similar to the nominate race but distinctly bluer on the tail, lacking the chestnut pectoral band, and being smaller.

Because the breeding season on these islands differs from that on the mainland, the post-nuptial molt occurs during the winter months. November birds in the material studied were very worn, while March and April birds were in fresh plumage.

Merops apiaster Linnaeus

Khorasan: Bardu, August 16, 1940, 1 unsexed imm.; Robat i Khan, September 1, 1 imm. ♀.

Luristan: Durud, April 21, 1941, 1 ad. ♂, May 7, 1 ad. ♀, May 17-23, 1941, 3 ad. ♀, May 24-25, 1940, 4 ad. ♂, 1 ad. ♀, September 7-11, 1 ad. ♂, 1 imm. ♂.

Afghanistan: Turuk Pul, May 10, 1937, 2 ad. ♀; Baghlan, July 1, 1 imm. ♂; Khanabad, July 3-4, August 31, 1 ad. ♂, 2 imm. ♂, 1 imm. ♀; Takia, Kishm, July 6, 1 imm. ♀; Gumbaz, Kishm, July 7, 2 imm. ♂; Faizabad, July 15, 1 unsexed imm.?; Iskan, August 3, 1 ad. ♀; Doao, August 23, 1939, 1 imm. ♂; Balkh, September 19, 1937, 1 ad. ♂, 1 imm. ♂, 1 imm. ♀.

India: Northwest Frontier Province, Parachinar, May 7, 1936, 1 ad. ♂.

Merops apiaster is very uniform over its extensive range across southern Eurasia from the Iberian Peninsula to western Siberia and there are no subspecies. In southwestern Asia this species breeds in Iran, Baluchistan, Afghanistan, and Kashmir. It is highly

migratory, wintering principally in southern Africa. The material collected by Koelz seems not to differ from other Indian specimens nor from examples from other parts of the range.

It is known that the molt of this species does not conform to the simple pattern of a single complete molt found in most of the Indian bee-eaters. After the breeding season, in August and September, adults of *apiaster* have a complete body molt into an eclipse plumage somewhat resembling the juvenal feathering. The adults in eclipse plumage may be distinguished from immatures by their worn rectrices and remiges, elongate central tail feathers, and yellower scapulars. On the wintering grounds in Africa adults and immatures alike undergo a complete molt during which both age classes acquire the nuptial plumage. The period of this winter molt falls between the months of October and February.

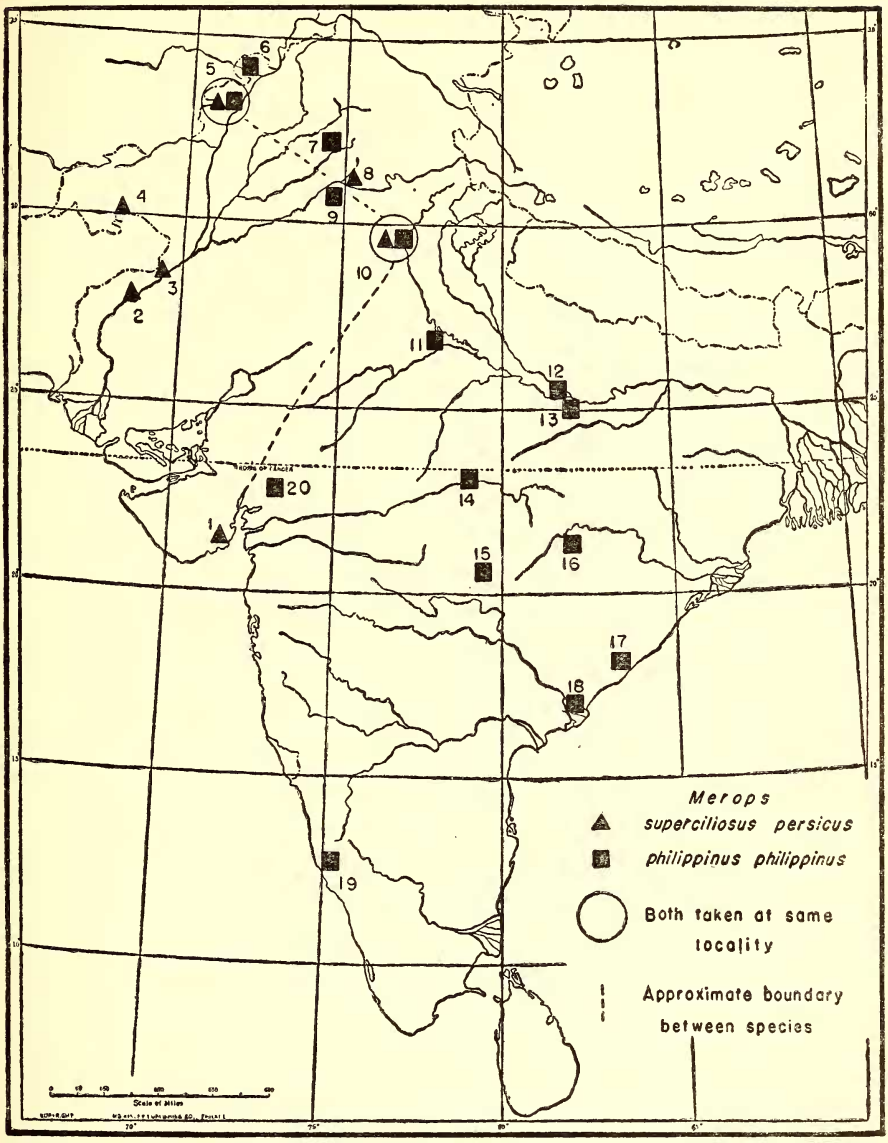
The molts of this species are reminiscent of those of the American tyrant flycatchers, Tyrannidae, which, according to Dwight (1900, *Annals N.Y. Acad. Sci.*, **13**: 136-137), postpone molting after nesting until reaching the winter quarters. Such cases of delayed molts may possibly be adaptations to permit early or extensive migration. Kipp (1936, *Mitt. Vogelwelt*, **35**: 77-78) in a study of migratory Palaearctic passerine birds found that those species whose winter quarters lie south of the Tropic of Capricorn have a winter molt which may be partial or complete. In some instances there is also a partial or complete molt during the summer preceding migration. The condition in *M. apiaster* agrees well with these observations since it winters in southern Africa and has its annual molt while in its southern quarters.

Measurements: Wing; males, 147, 149, 149, 150, 150, 153; females, 141, 142, 143, 143, 146, 148, 148. Tail: males, (central rectrices) 109, 109, 113, 114, 115, 115, 117, 119, (outer rectrices) 88, 89, 89, 90, 90, 92, 93, 94; females, (central rectrices) 102, 104, 105, 106, 108, 110, 113, (outer rectrices) 87, 88, 88, 89, 91, 91, 95. Bill: males, 27, 29, 29, 30, 30, 32, 32, 34; females, 24, 25, 25, 26, 27, 27, 30, 31.

Merops superciliosus and Merops philippinus

Some authors, most recently Peters (1945, Birds of the World, volume V, pp. 234-235), treat *M. philippinus* as a subspecies of *M. superciliosus*, but both groups are in fact quite distinct. There is a western, large, green-tailed form, *M. s. persicus*, that meets the eastern, smaller, blue-tailed form, *M. p. philippinus*, in northwestern India. Because the morphological differences between *philippinus* and *persicus* are not very striking and their ranges are contiguous, one would expect to find clear evidence of intergradation. Yet despite the similarity of appearance and the fact that except for a very narrow zone of overlap they replace each other geographically, no intermediates seem to have been reported. This, together with their physiological differences in molt, migration, and ecological adjustments to different climates suggest that they are not as closely related as would appear—are, in fact, allopatric species rather than subspecies.

Distribution. The distribution of the two species in India is shown in the accompanying map. Because the breeding season varies



Text-figure 1. Distribution of *Merops superciliosus persicus* and *Merops philippinus philippinus* during the breeding season in India, showing the narrow zone of overlap. The breeding range of *persicus* extends westward to Egypt; the breeding range of *philippinus* extends eastward to Malaya and Indo-China.

Triangles: *M. s. persicus*; squares: *M. p. philippinus*. Explanation of the numbered symbols is given in the text.

somewhat in different parts of the country and the movements of these bee-eaters are not well known, Mr. Sálim Ali has called to my attention the advisability of utilizing only those records of birds actually breeding. All of the records are taken from the literature. It will be noticed that there is very little overlap of breeding range; indeed, several authors have pointed out that where one form is found nesting the other is not known to breed.

The numbers refer to the positions on the map.

1. Bhavnagar, Kathiawar (Dharmakumarsinhji, 1947, *J. Bombay Nat. Hist. Soc.*, **46**: 723-724).
2. Khainju, Sukkur Dt., Sind (Baker, 1934, Nid. Bds. Indian Empire, **3**: 398).
3. Draklan, near Kashmor, Sind (Ticehurst, *Ibis*, 1923, p. 30).
4. Quetta, Baluchistan (Christison, *Ibis*, 1941, p. 544).
5. Bannu, N. W. Frontier Province (Magrath, 1908, *J. Bombay Nat. Hist. Soc.*, **18**: 685).
6. Peshawar, N. W. Frontier Province (Briggs and Osmaston, 1928, *J. Bombay Nat. Hist. Soc.*, **32**: 755).
7. Lahore, Punjab (Oates, 1890, Hume's Nests and Eggs of Indian Birds, **3**: 63-65).
8. Sultanapur, Punjab (ibid.).
9. Ferozepore, Punjab (Baker, 1934, op. cit., p. 397).
10. Delhi (Oates, loc. cit.).
11. Agra, United Provinces (ibid.).
12. Allahabad, United Provinces (ibid.).
13. Mirzapore, United Provinces (ibid.).
14. Hoshangabad, Central Province (ibid.).
15. Nagpur, Central Province (D'Abreau, 1935, *J. Bombay Nat. Hist. Soc.*, **38**: 105).
16. Raipur, Central Province (Oates, loc. cit.).
17. Waltair, Madras Prov. (Abdulali, 1945, *J. Bombay Nat. Hist. Soc.*, **45**: 342).
18. Rajahmundry, Madras Prov. (Neelakantan, 1948, *J. Bombay Nat. Hist. Soc.*, **47**: 741).
19. Coorg ('Feeding short-tailed juveniles'—Communication from Betts to Ali).
20. Gujarat (Littledale, 1886, *J. Bombay Nat. Hist. Soc.*, **1**: 196).

Ecology. *M. s. persicus* appears to be more tolerant of dry ground, and, at least in Iraq, may choose for a nesting site '. . . desert mounds or perfectly flat bare ground.' (Ticehurst, 1922, *J. Bombay Nat. Hist. Soc.*, **28**: 300), but in Afghanistan marshy areas are utilized (Whistler, 1944, *J. Bombay Nat. Hist. Soc.*, **44**: 291). For its nest hole *philippinus* prefers the banks of streams. In India, the limit of the range of *persicus* corresponds closely with the periphery of the dry area where the average annual rainfall is less than twenty inches.

Physiology. Besides being morphologically and ecologically distinct, these two forms differ physiologically. *M. s. persicus* makes a long southwestward migration in the autumn from its breeding grounds to its winter quarters in central and southern Africa. The post-nuptial molt is begun before migration (*vide infra*), but its progress is soon arrested; upon arrival on the winter range the birds undergo a complete molt. *M. p. philippinus* does not make such an

extended migration and the post-nuptial molt immediately follows the breeding season. The direction of migration of this form is south-eastward to southern India, Malaya, and the East Indies.

The east-west migration of *persicus* from northwestern India across Iran and Iraq to Africa suggests a recent range expansion correlated with the progressive desiccation of northwestern India in the not too distant past. A secondary zone of contact would thus seem to have been established where the two forms meet and behave like good species. It remains for Indian ornithologists to determine whether occasional hybridization occurs in this zone or whether there is complete reproductive isolation as it now appears.

Merops superciliosus persicus Pallas

Luristan: Beshedalan, June 13, 1941, 1 ad. ♂; Burujird, July 22-23, 2 ad. ♀, 1 imm. ♀, September 25, 1 ad. ♂, 2 imm. ♂, October 7, 1 imm. ♂, October 17, 1942, 2 ad. ♂; Durud, October 15, 1941, 1 imm. ♂, 1 ad. ♀, October 21, 1 ad. ♀, 1 imm. ♀.

Khorasan: Nishapur, September 20, 1940, 1 ad. ♂, 1 ad. ♀.

Afghanistan: Baghlan, July 1, 1937, 1 ad. ♂; Taliqan, July 5, 1 ad. ♂; Chah i Ab, August 20-23, 1 ad. ♂, 1 imm. ♂, 1 ad. ♀, 2 imm. ♀; Khanabad, August 31, 1 imm. ♂; Aq Cha, Septemer 8, 1 ad. ♂.

Breeds from Kathiawar, Sind, Rajputana, Delhi, southern and western Punjab, west to Baluchistan, Afghanistan, Iran, Iraq, Syria, and Palestine to Egypt. In Egypt it is known chiefly as a migrant, but a few breeding colonies exist in the Nile delta (Meinertzhagen, 1930, Nicoll's Birds of Egypt, vol. 1, p. 327).

According to Sálim Ali (1945, Birds of Kutch, p. 72) neither species is found breeding in Kutch, but just to the south in Kathiawar *persicus* reaches its southernmost limit on the Indian peninsula. Baker (New Fauna Vol. IV p. 239) ascribes all the breeding birds of Punjab and Rajputana to *persicus*, but that is not entirely accurate. It will be seen from the distribution map that both *persicus* and *philippinus* breed at Delhi. The range of *persicus* probably extends throughout the lower, drier region of northwestern India as far east as Delhi where it meets *philippinus* in the western section of the United Provinces. The latter race extends northwest along the mountains in Kumaon and northwestern Punjab to southern Kashmir and Peshawar. In Rajputana, *persicus* has been found (though not breeding) as far south as the Aravalli Hills and from there westward to Sind.

Winters in southern and central Africa. On migration it passes regularly through Bombay (September-November).

There seems to be some tendency in this subspecies to begin the post-nuptial molt before migrating. In numerous adults taken between August and October there is evidence that some, but not all, of the body feathers are being replaced. The scapulars and the first three or four primaries are always renewed at this time. This type of molting behaviour is intermediate between that of *M. p. philippinus* and the complete molt into an eclipse plumage of *M. apiaster*, but in the latter none of the primaries are shed in the pre-migratory molt. Once on the wintering grounds there is a complete molt, by both adults and immatures, extending from November to January, with extreme dates October 1 (Gaboon) and March 29

(British East Africa). Adults and birds in first year plumage are indistinguishable after this molt.

Measurements (males only): Wing, 150, 153, 154, 157, 158. Tail, 89.5, 91, 91, 93, 94. Bill, 35, 35, 35, 36, 37.

Merops philippinus philippinus Linnaeus

Punjab: Kangra, Bhadwar, April 16, 1933, 1 ad. ♂.

United Provinces: Kumaon, Lechiwala, September 1, 1948, 1 imm. ♂.

Nepal: Hitaura, July 3-7, 1947, 1 ad. ♂, 3 ad. ♀, 2 imm. ♂, 1 imm. ♀, July 15-29, 1 ad. ♀, 1 unsexed ad., 1 imm. ♂, 3 imm. ♀.

Assam: Khasia Hills, Umran, April 15, 1949, 1 ad. ♀.

Bihar: Mohammadganj, August 20-29, 1947, 2 ad. ♂, 1 imm. ♂, 2 ad. ♀, 5 imm. ♀, 1 unsexed imm., September 5, 1 ad. ♀.

Central Province: Bheraghat, April 11-12, 1946, 1 ad. ♂, 1 ad. ♀, April 23, 1 ad. ♀, May 11-19, 2 ad. ♂, 1 ad. ♀.

Madras Province: Ellore, February 2, 1937, 1 ad. ♀; Kasargad, February 27, 1 ad. ♀.

Southern Bombay Province: Jagalbed, February 24-March 4, 1938, 2 ad. ♂, 3 ad. ♀, 1 unsexed ad.; Castle Rock, March 5, 1 ad. ♀; Supa, February 27, 2 ad. ♀.

Breeds from Northwest Frontier Province, northeastern Punjab and the United Provinces and east through Nepal, Bihar, and Assam to Burma, Yunnan, Kwantung, French Indo-China and northern Malaya. The southern limits of its range are obscure, but the southernmost breeding record seems to be that of Betts (communication to Ali) who found it feeding short-tailed young in Coorg. Stresemann (1940, *Journ. Ornith.*, 88: 404) records this race breeding on Celebes.

The post-nuptial and post-juvenal molts may begin as early as July 4 (Nepal, female adult); some birds complete the molt as late as September 23 (Cachar, immature male). Young birds acquire the adult plumage through this molt. An immature female was taken on December 3 at Singapore, in worn plumage except for the new tertiaries and first six primaries, but such a late molt is exceptional.

Measurements: Wing, males, 131, 132, 132, 132, 132, 134, 135, 137; females, 121, 124, 124, 125, 126, 127, 127, 127, 127, 127, 127, 128, 128, 129, 131, 131. Tail, (outer rectrices), males, 87, 89, 91, 91, 91; females, 84, 86, 86, 87, 87, 88, 88, 89, 89, 89, 89, 90, 93. Bill, males, 31, 34, 34, 34, 34, 36, 36, 37; females, 31, 31, 31, 32, 32, 32, 32, 32.5, 32.5, 33, 33, 34, 34, 34, 35.

Merops orientalis

The range of this species extends from northern Africa across southern Asia to Annam. Nine subspecies are now recognized: two in Africa (*viridissimus*, *cleopatra*), three in Arabia (*cyanophrys*, *muscatensis*, *najdanus*), and four in the Iranian-Indo-Burmese area. The races of the last-named region are ill-defined, for they appear to comprise a single large variable population, the extremes of which

are certainly separable, but which intergrade into each other through an intermediate group.

The easternmost subspecies, *birmanus*, occurs in Upper Burma, Yunnan, Siam and Indo-China. It differs from the nominate race in having the upper back, nape, and crown ferruginous; this area is only slightly tinged with rufous in *orientalis*. The latter race is found throughout most of India and is morphologically and geographically intermediate between *birmanus* and the subspecies resident in Sind, northwestern India, Baluchistan, and Iran. This western race, *beludschicus*, is the palest, with only a golden sheen on the green of the head.

Recently, Whistler (1944, *Spolia Zeylanica*, **23**: 223) separated the Ceylon population, describing the new race, *ceylonicus*, as having the bill longer and stouter than the bill of nominate *orientalis*, but approaching *birmanus* in the amount of rufous on the nape and crown.

Examination of seventy-six specimens of this bee-eater in the Koelz Collection, twenty-two specimens loaned by the Museum of Zoology, University of Michigan, and of a large series in the collection of the American Museum of Natural History, including the type of *beludschicus*, indicates that the racial differences reported in the literature are greatly exaggerated. The subspecific characters are slight and the nominate race itself occupies the unfavourable position of an intermediate population between the distinct extremes. However, if large enough series are compared it is frequently possible to correctly place the specimens.

The Assamese population is usually referred to *birmanus*, but I find the northern Cachar birds to be most like *orientalis*; although approximating the richer color of the eastern subspecies the ferruginous color is restricted more to the nape.

In the northwest, birds from the Kangra Valley in Punjab are *orientalis*, but just where the border between the nominate subspecies and *beludschicus* is to be drawn is not apparent from the present material. It is not improbable that *beludschicus* will be found to range into the dry lowlands of Rajputana and southern Punjab, as does *M. s. persicus*, but, from lack of other evidence, it seems best to consider Punjab birds as referable to *orientalis* and not, as Peters (1945, *op. cit.*, p. 237) has it, to *beludschicus*.

Comparison of Koelz specimens from Iran with a series including the type and a topotype of *beludschicus* fails to show any noticeable differences. Four males from Tomogaon on the Iranian Plateau are slightly larger. A female from Dirak, Baluchistan, in the Rothschild Collection, shows characters of both *orientalis* and *beludschicus*. All these, however, are best referred to *beludschicus*.

Two specimens from Ceylon in the Rothschild Collection, an adult female and an unsexed adult, both collected in December, agree with Whistler's description as regards the amount of rufous on the head and nape, but the bill, though scarcely stouter, is not longer. It seems unfortunate that this population was named, especially since the species has already been badly split, but I would want to see more material before synonymizing *ceylonicus* with *orientalis*.

Considering the three Indian mainland races as one population, it can be said that the easternmost birds are most rufous on the crown

and nape; the intensity of color decreases towards the western limits of the range. In the west the throat is a pale blue, the blue showing a tendency to decrease and to be confined more to the cheeks toward the easterly limits of the range. In the west the underparts tend to be bluish-green and the upperparts pale green; the trend in an eastward direction is toward more yellow-green underparts and darker upperparts.

There are no appreciable size differences affording any basis for separating the four subspecies. The length of the central tail feathers was found to be quite variable within each race; only some of the variation could be ascribed to wear. Measurements are tabulated under the subspecies headings.

Males display a tendency to develop the central pair of rectrices more beyond the tip of the tail than do females.

Nesting takes place principally in April and May. The annual post-nuptial molt is complete and takes place from July to September. In birds of the year a complete post-juvenal molt occurs at about the same season.

Merops orientalis orientalis Latham

Northern Punjab: Kangra Valley, Bhadwar, April 9-10, 1933, 2 ad. ♀; Baijnath, May 19, 1 ad. ♀, May 26, 1936, 1 ad. ♂; Hissar, Sirsa, Jan. 20-Feb. 1, 1933, 5 ad. ♂, 2 ad. ♀; Panwali, March 8, 1 ad. ♀; Lahore, Feb. 9-17, 2 ad. ♂, 2 ad. ♀.

United Provinces: Gorakhpur, January 28, 1947, 1 ad. ♂; Nichlaul, February 9, 1 ad. ♂, February 12, 1 ad. ♀; Khada, February 26, 2 ad. ♂; Lechiwala, September 2, 1948, 1 ad. ♂; Lucknow, December 13, 1936, 1 ad. ♂, 2 ad. ♀.

Nepal: Simra, March 6, 1947, 1 unsexed ad.

Bihar: Raxaul, March 1, 1947, 1 ad. ♀; Garhwa Road, September 10-15, 3 ad. ♂, 3 ad. ♀.

Bengal: Dacca, January 12-13, 1937, 3 ad. ♂.

Surguja: Ramanujganj, September 27-October 2, 1947, 2 ad. ♂, 3 ad. ♀.

Central Province: Seven miles north of Jubbulpore, February 23-24, 1946, 1 ad. ♂, 1 ad. ♀; Bheraghat, March 11, 1 ad. ♂, 1 ad. ♀; Mandla, June 26, 1 imm. ♀; Belwani-Kisli, September 28, 1 ad. ♂.

Bastar: Kesarpal, March 29, 1949, 1 ad. ♂.

Mewar State: Udaipur, April 22, 1937, 1 ad. ♀.

Madras Province: Foot of Mahendra, January 26, 1937, 1 ad ♀; Rati, January 31, 1 ad. ♀; Sidhout, March 22, 1 ad. ♂; Salem, April 7, 1948, 1 ad. ♂.

Northern Bombay Province: Junagadh, Jamwala, January 31, 1939, 1 ad. ♀, February 11, 1 ad. ♂, 1 ad. ♀.

Southern Bombay Province: Londa, January 8, 19-20, 31, February 1-4, 13-15, 1938, 2 ad. ♂, 8 ad. ♀; Jagalbed, February 20-25, March 3, 1 ad. ♂, 2 ad. ♀; Supa, February 26, 1 ad. ♂.

Measurements: Wing, 20 males, 89-97 (93.6), 22 females, 89-95 (91.4). Tail, 19 males, 68-74 (71.2), 24 females, 65-74 (70.4). Bill, 25 males, 20-25 (23.2), 27 females, 19-26 (22.6).

Merops orientalis beludschicus Neumann

Iran: Iran: Tomogaon, February 3-4, 1940, 4 ad. ♂, 5 ad. ♀.
Kirman: Saadatabad, December 23, 1939, 1 ad. ♂.
Luristan: Isin, December 16-19, 1939, 3 ad. ♂, 2 ad. ♀; Bandar Abbas, December 21, 1 ad. ♂.
Fars: Borazjun, April 11, 1940, 1 ad. ♀.
India: Sind: Khinjar Lake, January 18, 1934, 1 ad. ♀, Jan. 23-Feb. 27, 3 ad. ♂, 3 ad. ♀; Karachi, December 3, 1939, 1 ad. ♀.
Measurements: (Tomogaon birds listed separately) Wing: males, 94, 94, 95, 96; females, 86, 90, 95, 95, 98; Tail: males, 69, 70, 71, 73, 73; females, 68, 69, 70, 70, 73; Bill: males, 22, 23, 24, 24, 24; females, 19, 21, 21, 23, 24. Tomogaon specimens: Wing: males, 95, 98, 99, 100; females, 91, 93, 94, 96, 99; Tail: males, 70, 73, 74, 77; females, 70, 72, 75, 78; Bill: males, 25, 25, 25, 26; females, 22, 22, 24, 25.

Nyctyornis athertoni athertoni (Jardine and Selby)

Nepal: Simra, March 4, 1947, 1 ad. ♂, 1 ad. ♀; Amlekhganj, March 9, 1 ad. ♂; Thankot, March 28, 1 ad. ♂; Hitaura, May 23, 1 unsexed ad., June 3, 1 imm. ♂, 1 imm. ♀, 1 unsexed imm., June 12-24, 3 ad. ♂.
United Provinces: Kumaon, Kathgodam, August 20, 1948, 1 ad. ♂; Lechiwala, September 1-2, October 28-30, 5 ad. ♂, 3 ad. ♀.
Bengal: Siliguri, December 29-30, 1936, 2 ad. ♀; Darjeeling District, Badamtam Forest, Rangit, December 24, 1 ad. ♂.
Assam: Khasia Hills, Nongpoh, May 3, 1949, 1 ad. ♂. June 22-28, 1 ad. ♂, 1 ad. ♀, 2 imm. ♂, 1 imm. ♀; Barni Hat, June 2, 1 ad. ♂, 1 ad. ♀, 1 imm. ♂, 2 imm. ♀, 1 unsexed imm.
Surguja: Ramanujganj, October 2, 1947, 1 ad. ♂.
Central Province: Kanha, August 13-30, 1946, 1 ad. ♂, 2 ad. ♀.
Southern Madras Province: Nilgiri Hills, Kunjapanai, February 20, 1937, 1 ad. ♂, 1 ad. ♀.
Southern Bombay Province: Jagalbed, February 18, 1938, 1 ad. ♂.

Nyctyornis athertoni is a forest bird of the Indo-Malayan region ranging from Travancore and Belgaum in southern India, the Central Provinces (but not yet reported from Chota Nagpur[1]), Nepal, and the United Provinces, to Assam, Vizagapatam Hills, Bengal, Burma, Siam, Indo-China, and Hainan. Its distribution in southern and central India is curious, the bird being not very common and existing for the most part in isolated ecological pockets. Sálim Ali (1948, *Gujarat Research Society, Monograph No. 2*) and Ripley (1949, *Evolution*, 3: 150-159) believe that this species and many other Indian species exhibiting similar distributions spread south from the Himalayas or the Kaimur Ridge-Vindhyan chain of hills during periods of low temperature and high humidity, only to become isolated during following periods of higher temperatures and increasing desiccation. In effect, *N. athertoni* is a relict species in southern India.

[1] Sálim Ali has recently collected specimens in Keonjhar and the Simlipal Hills (Mayurbhanj), Northern Orissa.—EDS.